

# SPECIFICATION OF THE PATENT OF INVENTION FOR "AN ELECTRIC MOTOR ASSEMBLY AND A METHOD OF ACTUATING AN ELECTRIC MOTOR"

5 The present invention relates to an electric motor assembly and to a method of actuating an electric motor.

## Description of the state of the art

10 The prior-art electric motors have their start-up or running electrical current values limited to those permitted by the electricity supply companies. This limitation is for the purpose of preventing high energy peaks that could overload the electrical network, thus causing undesirable consequences, for example damage to electrical equipment. However, this limitation of electrical current values causes an undesirable limitation to the power of the motor.

15 In order to overcome this problem, higher powered triple-phase motors make use of "delta-star"- type starting switches, compensators, soft-starters or frequency inverters, so that such devices minimize the effects of peaks in the starting current. These devices, however, have the drawback of being very costly.

20 Moreover, in conventional monophase motors, and mainly in rural areas, these devices cannot be used, so the maximum power ratings of such motors are generally limited to between 5HP and 15HP, due to the electrical current limitations imposed by the electricity supply companies. Thus, these monophase motors have the drawback that their power is limited by the permitted ranges of starting currents.

## Objectives of the invention

25 The first objective of the present invention is to provide an electric motor assembly, the actuation of which uses starting current within the ranges permitted by the electricity supply companies.

Another objective is to provide an electric motor assembly that involves manufacturing costs lower than those of prior-art motors.

30 The third objective is to provide an electric motor assembly with a maximum power that is not limited by the current ranges determined by the electricity supply companies.

The fourth objective is to provide a method for actuating a high-powered electric motor that uses electrical current within the ranges permitted by the electricity supply companies.

### **Brief description of the invention**

The present invention achieves these objectives by means of an electric motor assembly comprising a main electric motor and a coupled electric starter motor suitable for starting the main motor. The electric starter motor has less power than the main motor, preferably in the range 5HP to 15HP, due to the fact that the current utilized by this electric starter motor is limited to the current permitted by the electricity supply companies for a direct start. In addition, in one possible embodiment, the power value of the electric starter motor can reach approximately 15HP. On the other hand, the power value of the main electric motor is higher and can reach about 50HP or more, as determined by the electricity supply companies. In this way, in order to avoid high current peaks, which occur upon starting a high-powered motor, such as the aforementioned main electric motor, an electric starter motor coupled to the latter is used, which, as already stated, has less power, the current peaks not exceeding the ranges permitted by the electricity supply companies. Thus, before starting the main electric motor, its rotation is accelerated by the starter motor up to its nominal rotation without load (maximum rotation of the synchronous rotation), so that, when the main electric power is actuated, it is already rotating, which reduces the intensity of current required for the start-up, maintaining the current peaks within the ranges permitted by the electricity supply companies.

The present invention further relates to a method of actuating an electric motor, which comprises a first step consisting of actuating the electric starter motor whose operation is coupled to a main electric motor. These motors are preferably those defined in the preceding paragraph, without the method of the present invention being limited to the utilization of motors with the stated powers. The next step consists of switching off the electric starter motor when the latter reaches its nominal rotation. At this step, the main electric motor is also actuated, and, in a first embodiment, this may be done simultaneously with the switching off of the starter motor, or in other embodiments, just before or after the starter motor is switched off.

Thus, the present invention allows higher powers to be obtained, without, in the case of triple-phase motors, the need for expensive devices such as soft-starters or frequency inverters to minimize starting current peaks.

### **Description of the drawings**

The present invention will now be described in greater detail with reference to an embodiment represented in the drawing.

- Figure 1 shows a view of an electric motor of the prior art;
- Figure 2 shows a view of an electric motor assembly according to the present invention.

### **Detailed description of the figures**

Figure 1 shows an embodiment of an electric motor of the state of the art.

Figure 2 illustrates one of the possible embodiments of the electric motor assembly 1 of the present invention, where the electric starter motor 3 whose operation is coupled to the main electric motor 2 by means of the rotation axle 4. This coupling between the motors does not need to be on the same axle; in other embodiments, it may be on different axles and may be effected by means of pulleys, gears, among other coupling means.

The electric starter motor 3 is suitable for starting the main electric motor 2. In addition, the electric starter motor 3 has a power rating of up to 15 HP, so that upon its actuation the current peaks reached will lie within the ranges permitted by the electricity supply companies. On the other hand, the power of the main electric motor 2 is 50 HP. In other embodiments, the present invention could have power values different from those mentioned above.

The start of the main electric motor 2 is effected by actuating the electric starter motor 3, which, by means of the rotation axle 4, transmits mechanical energy to the former, so as to accelerate its rotation. As already mentioned above, the value of the current peak involved in this actuation is within the ranges permitted by the electricity supply companies, since only the low-powered motor 3 is actuated. This acceleration increases the rotation of the main electric motor 2 until the nominal rotation of the electric starter motor 3 is reached. At this point, the motor 2 may already be actuated, and, since it is already at its nominal rotation, the current peak that would occur if the motor were actuated from rest is prevented, the current remaining within the permitted ranges. In this way, it is possible to actuate a motor with a power of, say, 50HP with low current peaks. The switching-off of the starter motor is effected, in this embodiment, simultaneously with the actuation of the main motor. In other embodiments, one can also switch it off just before or after the main motor is actuated.

In another embodiment, not shown, one may use two motors having the same

power, coupled by means of any of the above-described ways. One of the motors is actuated, while the other is off, so that both accelerate until they reach their nominal rotation. When the nominal rotation is reached, the second motor is then started, and the two motors begin to work together. In this way, one achieves high power with a peak of actuation current at the levels permitted by the electricity supply companies. In addition, the starting of the main electric motor may be carried out just before or after the latter has reached its nominal rotation.

Having described the preferable embodiments of the invention, it should be understood that the scope of the present invention embraces other possible variations, limited only by the content of the accompanying claims.